EFFECTS OF A MERCURY OXIDANT ON SCR CATALYST FOR PRB COAL

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SUMMARY

Pilot scale combustion tests were conducted at the Pilot Scale Research Boiler (PSRB) facility of the CANMET Energy Technology Center in Ottawa. The facility is a 1.5 MM Btu/h boiler equipped with a series of pollution control devices (PCD's) that include an electrostatic precipitator (ESP), a fabric filter (FF) and a wet flue gas scrubber. The tests were designed to evaluate the effects of a particular oxidant to oxidize mercury in the flue gas in the presence of a typical SCR catalyst while burning a PRB coal. Specifically, the effects on the potential of the catalyst to oxidize mercury while injecting the oxidant were evaluated, and also to ensure there was no catastrophic effect on the catalyst. This meant comparing the physical and chemical characteristics of the test catalyst to the baseline physical and chemical characteristics to make sure the catalyst's ability to remove NO_x was not compromised. A test probe was designed and constructed of quartz in which the plate type catalyst was housed parallel with the flue gas flow with an injection port upstream of the catalyst for ammonia injection. The catalyst was designed for an area velocity of 9.0 m/h, simulating the SCR's installed at the Nanticoke Thermal Generating Station. The corresponding space velocity was about 6000 h^{-1}. The entire probe was heated in a tube furnace and maintained at a temperature of about 600 to 700^{o}F while a flue gas slipstream was isokinetically pulled over the catalyst at a rate of approximately 0.57 ft^3/min. Ammonia was injected at an NH_3 to NO_x stoichiometry of 0.8.

Results obtained with the Ontario Hydro mercury sampling method while burning the 100% PRB coal showed baseline mercury oxidation of about 25%. Injecting the oxidant showed enhanced oxidation of mercury being about 90%. Pulling a slipstream of the flue gas over the fresh catalyst only (no oxidant) showed mercury oxidation to be about 86% suggesting that the SCR catalyst was very effective at converting elemental mercury to oxidized mercury. Injecting the oxidant in combination with the SCR catalyst showed similar mercury oxidation levels. This suggests that both the oxidant and the fresh catalyst were efficient in oxidizing mercury. Ammonia did not appear to influence mercury oxidation chemistry. Chemical and physical characterization of the catalyst showed no change from the base catalyst. Catalyst activity measured as a function of NO_x removal also showed no change in performance level from the base catalyst. At an NH_3 to NO_x stoichiometry of 0.8, NO_x removal was 76%.

Future work will include tests with an aged catalyst and with a blend of PRB and eastern US bituminous coal.

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